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RAILROAD ACCIDENT REPORT



SIDE COLLISION OF
TWO MISSOURI PACIFIC RAILROAD COMPANY
FREIGHT TRAINS
AT GLAISE JUNCTION,
NEAR POSSUM GRAPE, ARKANSAS
OCTOBER 3, 1982



NTSB/RAR-83/06

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UNITED STATES GOVERNMENT

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TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB/RAR-83/06	2. Government Accession No. PB83-916306	3. Recipient's Catalog No.	
4. Title and Subtitle Railroad Accident Report--Side Collision of Two Missouri Pacific Railroad Company Freight Trains at Glaise Junction, Near Possum Grape, Arkansas, October 3, 1982		5. Report Date June 14, 1983	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s)		10. Work Unit No. 3691A	
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594		11. Contract or Grant No.	
		13. Type of Report and Period Covered Railroad Accident Report October 3, 1982	
		14. Sponsoring Agency Code	
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594			
15. Supplementary Notes			
<p>16. Abstract About 4:15 a.m., on October 3, 1982, a Missouri Pacific Railroad Company (MP) southbound freight train Extra UP 2948 South collided with the eighth car ahead of the caboose of an opposing freight train, MP Extra UP 2437 North, at a rail junction known as Glaise Junction on the MP near the community of Possum Grape, Arkansas. The three-unit locomotive and the following nine cars of the southbound train derailed, and the second through eighth cars ahead of the caboose on the northbound train derailed. The engineer and the head brakeman of the southbound train were killed on impact; the conductor of the northbound train was injured and hospitalized. Fire broke out at the overturned lead unit. Damage was estimated to be \$1,047,000.</p> <p>The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crewmembers on the locomotive of Extra UP 2948 South to reduce the speed of the train, in response to a signal displaying an approach aspect, and to stop the train in response to the junction home signal displaying a stop aspect. Contributing to the accident were: (1) the action of the alcohol-impaired engineer in relinquishing control of the train to the head brakeman who was not a qualified engineer, (2) the failure of the conductor to monitor the engineer's performance in operating the train within prescribed speed limits, (3) the failure of Missouri Pacific Railroad Company officials to supervise the involved operating personnel adequately, and (4) the failure of the conductor and the other involved operating department employees to take proper action when rule violations were apparent.</p>			
17. Key Words collision; freight trains; alcohol; operating rules; safety rules; supervision; crashworthiness; conductor		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 31	22. Price

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Adopted: June 14, 1983

**SIDE COLLISION OF
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SYNOPSIS

About 4:15 a.m., on October 3, 1982, a Missouri Pacific Railroad Company (MP) southbound freight train Extra UP 2948 South collided with the eighth car ahead of the caboose of an opposing freight train, MP Extra UP 2437 North, at a rail junction known as Glaise Junction on the MP near the community of Possum Grape, Arkansas. The three-unit locomotive and the following nine cars of the southbound train derailed, and the second through eighth cars ahead of the caboose on the northbound train derailed. The engineer and the head brakeman of the southbound train were killed on impact; the conductor of the northbound train was injured and hospitalized. Fire broke out at the overturned lead unit. Damage was estimated to be \$1,047,000.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crewmembers on the locomotive of Extra UP 2948 South to reduce the speed of the train, in response to a signal displaying an approach aspect, and to stop the train in response to the junction home signal displaying a stop aspect. Contributing to the accident were: (1) the action of the alcohol-impaired engineer in relinquishing control of the train to the head brakeman who was not a qualified engineer, (2) the failure of the conductor to monitor the engineer's performance in operating the train within prescribed speed limits, (3) the failure of Missouri Pacific Railroad Company officials to supervise the involved operating personnel adequately, and (4) the failure of the conductor and the other involved operating department employees to take proper action when rule violations were apparent.

INVESTIGATION

The Accident

Train Extra UP 2437 North.--Missouri Pacific Railroad Company (MP) freight train OSMU02, operating as Extra UP 2437 North, consisted of a 3-unit diesel electric locomotive, 71 loaded freight cars, and a caboose. The train was being operated by an MP traincrew as an interdivisional 1/ train originating at the Southern Railway's Sheffield yard in Memphis, Tennessee, and was to continue to the Union Pacific Railroad (UP) yard at North Platte, Nebraska. The MP crew was to go off duty at the MP's Cotter yard near Mountain Home, Arkansas--a distance of 245 miles from Memphis. (See table, figure 1.) The train had departed Memphis at 12:50 a.m., on October 3, 1982, after a satisfactory

1/ Train operated over three subdivisions of the Arkansas Division.

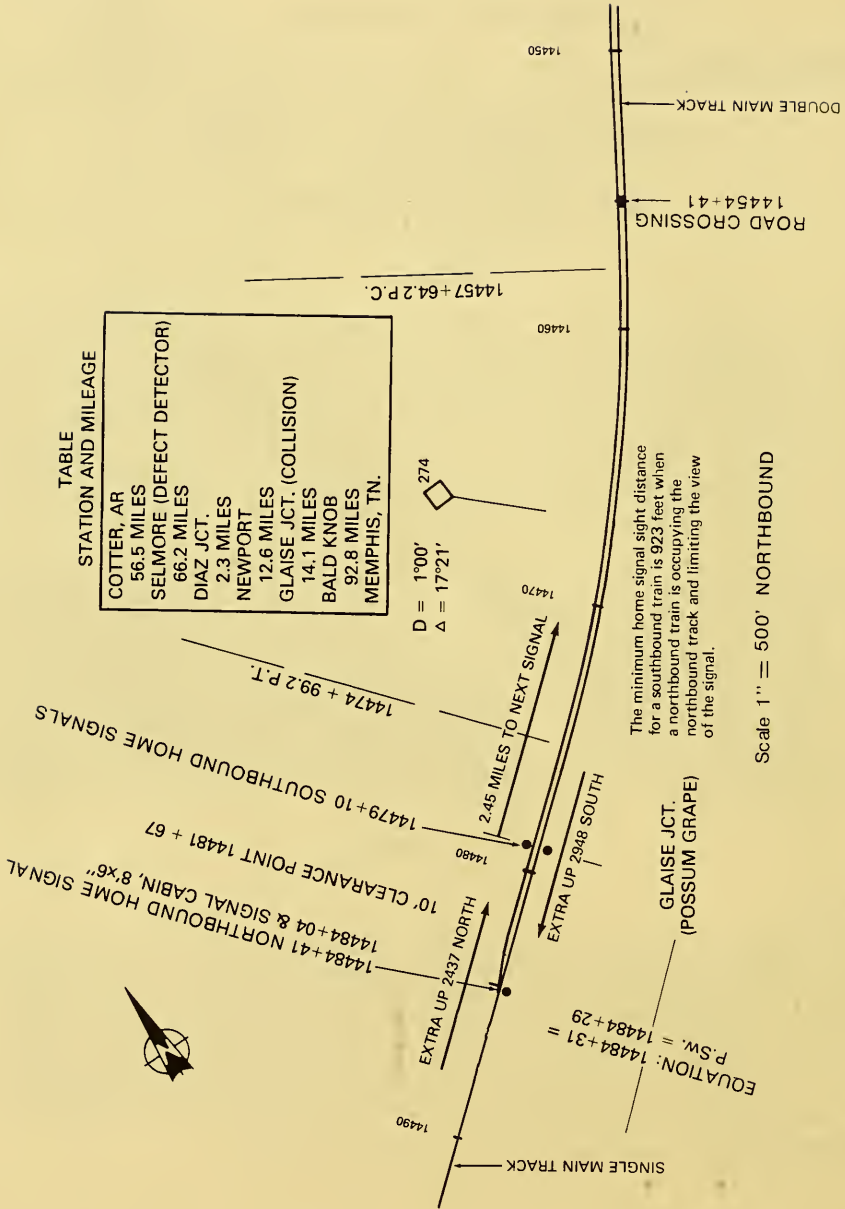


Figure 1.--Plan view of track at accident site.

initial terminal air brake test and was operated to Glaise Junction, Arkansas, a distance of 107 miles, without incident. The engineer was seated at the controls of the lead locomotive unit, and the fireman and head brakeman were seated in their respective positions on the left side of the same cab as the train approached Glaise Junction. The conductor and rear brakeman were in the caboose. About 4:13 a.m., as Extra UP 2437 North approached the Glaise Junction switch, the train dispatcher aligned the remotely controlled switch and signal to enable Extra UP 2437 North to exit the single main track and enter onto the west track of the two-track system north of that location. (See drawing, figure 1.)

Train Extra UP 2948 South.--MP freight train OUMS02, operating as Extra UP 2948 South, consisted of a 3-unit diesel electric locomotive, 79 freight cars, and a caboose. The train was also an interdivisional operation, originating at North Platte on the UP and was to continue to Sheffield yard in Memphis. At 12:45 a.m., at Cotter, Arkansas, the crew assigned to operate the train between Cotter and Memphis boarded; the engineer, conductor, and two brakemen had reported for duty at 12:15 a.m. A second four-man crew also boarded the train at Cotter, but this crew was to deadhead (use the train for transportation) to Newport, Arkansas. However, before the crews boarded the train, the deadheading conductor overheard a conversation in which the assigned engineer claimed he was unfamiliar with the route, and the assigned engineer and the assigned conductor asked the deadheading engineer to operate the train between Cotter and Newport.

As the train departed Cotter, the deadheading engineer was seated at the controls in the lead locomotive unit. The assigned engineer and assigned head brakeman were in the rear and front seats, respectively, on the left side of the same cab. Both deadheading brakemen were seated in the cab of the second locomotive unit which was facing north. The deadheading conductor sat in the engineer's seat and the assigned rear brakeman sat on the left side of the cab of the third unit, which also was facing north. There was no radio communication between the conductor in the caboose and the crewmembers on the head end of the train between Cotter and Newport, even though the train passed a defect detector at Selmore (MP 235) after which the conductor should have communicated the condition of the train to the engineer. None of the assigned crewmembers or the deadheading crewmembers reported taking exception to anything during the trip to Newport where the deadheading crew detrained. The assigned conductor stated that he tried to contact his engineer by radio during that trip but was not successful because of "dead spots." 2/

The Newport operator recorded Extra UP 2948 South as having departed Newport at 3:45 a.m., on October 3, 1982; however, the deadheading engineer, who took part in a roll-by inspection of the train as it left Newport, stated that the time was actually 4 a.m. The assigned rear brakeman told Safety Board investigators that the assigned engineer and head brakeman were in the cab of the lead unit, that the assigned conductor was in the caboose, and that he was in the cab of the second unit when the train left Newport. He said he rode in the second unit instead of the lead unit because of a previous altercation with the engineer. The train was on the east track as it approached Glaise Junction from the north. The conductor did not attempt to contact the head end of his train after departing Newport and stated that he was not certain who was operating the train; but assumed it was the engineer even though the engineer had claimed to be unfamiliar with the territory.

2/ Locations along the railroad where radio communication is inhibited because of characteristics of the terrain or other environmental conditions.

The Collision.--Extra UP 2437 North was already moving through the switch at Glaise Junction at a speed of slightly less than 50 mph, according to the engineer, when the headend crew saw the headlight of Extra UP 2948 South approaching. The occupants of the locomotive cab of the northbound train estimated the speed of the southbound train to be 35 to 45 mph as the opposing locomotives passed at the first road crossing north of Glaise Junction. (See figure 1.) They estimated that about one-half of their train was through the switch and thought that the southbound train may have been going too fast to stop short of the home signal at Glaise Junction (MP 274.3). Within seconds after the locomotives passed, the engineer of the northbound train heard the sound of what he believed to be an emergency air brake application emanating from the southbound train. The sound of the emergency application of the brakes was followed within seconds by an undesired emergency application of the northbound train's air brakes. The time was about 4:15 a.m.

When Extra UP 2437 North was stopped as a result of the emergency application of the air brakes, the head brakeman and fireman proceeded toward the rear of their train. Upon their arrival, they observed that Extra UP 2948 South had collided with the eighth car ahead of their caboose. (See figure 2.) The Extra UP 2948 South's lead locomotive unit had derailed, rotated 180°, and turned over before it came to rest at the foot of an embankment and about 30 feet from the track where it was engulfed in a fire fed by diesel fuel and oil. (See figure 3.) The caboose of Extra UP 2437 North and car ahead rolled backward on the track about 0.4 mile before they stopped. (See figure 4.)

The conductor and rear brakeman of the northbound train survived; the conductor was injured and required hospitalization. Attempts by the surviving employees to remove the fatally injured occupants of the crushed locomotive cab of Extra UP 2948 South were thwarted by the intense heat of the fire. When the bodies were removed after the fire was extinguished, the head brakeman's body was found pinned in the engineer's seat at the controls. The engineer's body was found on the head brakeman's side of the cab.

At the time of the collision, the sky was cloudy and the temperature was 70° F.

Injuries to Persons

<u>Injuries</u>	<u>Crew of</u> <u>Extra UP 2948 South</u>	<u>Crew of</u> <u>Extra UP 2437 North</u>	<u>Total</u>
Fatal	2	0	2
Nonfatal	0	1	1
None	2	4	6
Total	4	5	9

Damage

Trains.--The cab of the lead locomotive unit of Extra 2948 South was severely deformed during the collision and was deformed further as it rolled down the embankment on the east side of the fill supporting the track. Fuel oil leaked from the overturned unit's damaged fuel supply tanks and was ignited. The other locomotive units and nine following freight cars were damaged heavily. Damage to the train was estimated to be \$646,000. The eighth car from the rear and the following six cars in Extra UP 2437 North were damaged heavily as a result of the collision. The caboose and the car immediately ahead were not damaged. Damage to the train was estimated to be \$131,000. The combined loss of lading for both trains amounted to \$165,000.



Figure 2.—Overview of collision/derailment site.

Other Damage.--A relay house containing signal system equipment for Glaise Junction and vicinity was struck by derailling equipment and rolled onto its side. As it rolled over, electrical relays inside were dislocated. About 700 feet of track was damaged, including the power switch at Glaise Junction. Damage to signals and track was \$65,000 and \$40,000, respectively.

<u>Item</u>	<u>Damage</u>
Equipment (Train UP 2948 South)	\$ 646,000
Equipment (Train UP 2437 North)	131,000
Lading both trains	165,000
Signals	65,000
Track	40,000
Total	<u>\$1,047,000</u>

Crewmember Information (Train Extra 2948 South)

Engineer.--The locomotive engineer assigned to operate Extra UP 2948 South on October 3, 1982, was 35 years old. He began his employment with MP on May 29, 1966, as a temporary locomotive fireman. On September 19, 1972, he was promoted to locomotive



Figure 3.—Derailed locomotive units.

engineer and had been employed in that capacity by MP since. He was dismissed for about 3 months in September 1968 and for 10 deferred days in October 1969 for violations of operating rule Q (see appendix C). He received a 45-day suspension for violation of a maximum speed restriction in October 1975, and again for 15 deferred days in June 1979 because of a similar violation. He was last examined on the MP operating rules on April 8, 1982.

He had been assigned as locomotive engineer for seven round trips, including this trip, over the involved trackage. Several of these trips were made with the assigned conductor. The engineer was qualified to operate the train on the trackage involved under MP's operating rules.

Head brakeman.--The head brakeman, aged 45, was first employed by the MP as a yardman on August 5, 1956. He most recently had been assigned to road service about the beginning of September 1982. He had been dismissed for 22 days in May 1980 for violation of operating rule 100, which involved leaving and not protecting a train standing in a main track; the violation resulted in a collision. He was last examined on the MP operating rules on April 21, 1982. Because the MP biennial operating rules test requirement for train and engine crews is conducted orally in groups, there was no documentation of the front brakeman's proficiency in this regard, nor in respect to signal rules.

At the time of the accident, the brakeman did not have extensive experience over the road, and the carrier had no requirement for a brakeman to make familiarization trips over trackage to which assigned.

Conductor.--The conductor, aged 51, was first employed by the MP as a switchman in November 1953. He was promoted to conductor on August 10, 1972. He was suspended for 30 days in December 1973 for violation of operating rules B and Q (see appendix C), again for 15 days in February 1975 for similar violations, and dismissed for 4 months in August 1975 for violation of rule Q. He was again dismissed for about 2 1/2 months in June 1976 for violation of rules B and T. (See appendix C.) He was last examined on the MP operating rules on January 22, 1980.

Rear brakeman.--The rear brakeman, aged 56, was first employed by the MP as a switchman on October 17, 1947. He most recently had been assigned to road service about the beginning of September 1982. The MP has no record as to the date he was last examined on the MP operating rules. At the time of the accident, the brakeman did not have extensive experience over the road, nor was he required to familiarize himself with the road.

Train Information

Extra UP 2948 South.--The locomotive of this train consisted of three diesel-electric units. The lead unit, UP 2948, was owned by the Union Pacific Railroad Company and was a General Electric Model U-30-C. The unit was manufactured on September 26, 1976, weighed 398,676 pounds, and was equipped with a 26-L locomotive-type air brake. It was equipped with an operable radio and speedometer, but was not equipped with a speed-recording device. The second and third units, MP 3222 and MP 3282, respectively, were manufactured by the Electro-Motive Division of General Motors Corporation. Each unit was a model SD-40-2 and weighed 393,320 and 389,580 pounds, respectively. Unit MP 3282 was equipped with a speed-recording device. According to the deadheading conductor who had been riding in unit MP 3282, the recorder was functioning properly between Cotter and Newport. Several hours after the accident, the recorder case was found by an MP official to have been broken open and the tape missing even though the locomotive cab was not damaged. Neither the MP nor the Safety Board, after questioning witnesses at the scene of the accident, have been able to determine what happened to the recorder and tape.

The train consisted of 60 loaded freight cars, 19 empty freight cars, and a caboose for a total weight of 6,884 gross tons and a total length of 5,283 feet including the caboose. Investigators inspected the train's equipment following the accident and found nothing that could have contributed to the cause of the accident.

Extra UP 2437 North.--This train consisted of Union Pacific diesel-electric units 2437, 3019, and 3431, 49 loaded freight cars, 23 empty freight cars, and a caboose. The train's gross tonnage was 4,762 tons, and it was 4,781 feet long.

Track Information

The railroad in the vicinity of Glaise Junction consisted of a single main track to the south and a two-main-track system to the north. Beginning at the approach signal north of Glaise Junction (MP 217.8), track to the south consisted of: a 5,546-foot-long, tangent; a 0°30', 435-foot-long curve to the right; a 5,861-foot-long tangent; a 1°00', 1,735-foot-long curve to the right, and an 830-foot-long tangent to the point-of-switch

at Glaise Junction. The home signal for the switch at Glaise Junction, which controlled the movement of train Extra UP 2948 South, was 519 feet north of the point-of-switch. The next southbound signal in advance of the home signal was located 12,936 feet from the home signal. This automatic signal is the approach signal to the home signal at Glaise Junction to give information to the engineer on the indication of the next signal (home signal). The 10-foot clearance point for the switch at Glaise Junction was 264 feet north of the point-of-switch.

Method of Operation

Train movements in the vicinity of Glaise Junction are governed by signal indications of an automatic block signal and traffic control system that is remotely controlled by a train dispatcher in North Little Rock, Arkansas. Maximum allowable speed for freight trains over the line was 60 mph, reduced to 50 mph through the turnout at Glaise Junction. Operating department employees are governed by the Uniform Code of Operating Rules and Timetable Special Instructions. (See appendixes C and D.)

According to MP's operating rule E, crewmembers are required to assist each other in carrying out the rules. Rule G prohibits the use and possession of intoxicants or narcotics while on duty. Rule Q prohibits crewmembers' exchanging duties or substituting controls in their place. Rule 101 and Special Instruction on rule 34 and 34A require all crewmembers to know the speed of the train and whether it is being operated safely; if it is not, the rule requires that they take action to see that the train is operated safely. While rule 107 places general charge of the train with the conductor, it places joint responsibility on the conductor and engineer for the safe and proper handling of the train. (See appendixes C and D.)

Medical and Pathological Information

The engineer and head brakeman of the southbound train were killed when the cab of the lead unit of Extra UP 2948 South was crushed in the collision. The rear brakeman, who was seated in the cab of the second unit sustained a sprained ankle, and the conductor, who was in the caboose was not injured. The conductor on board Extra UP 2437 North sustained injuries to his right shoulder, right arm and elbow, tailbone and left hip when thrown into the wall and holding tank of the caboose restroom during the collision impact.

A check of dental records determined that the body removed from the left side (front brakeman's side) of the locomotive cab of the lead unit of Extra UP 2948 South was that of the engineer. The other body removed from the cab of the lead unit had been pinned in position at the engineer's controls; it was determined to be that of the head brakeman.

Toxicological tests, performed about 24 hours after the accident, on postmortem blood and urine samples from the engineer of Extra UP 2948 South indicated that he had a 0.04 percent blood alcohol concentration (BAC) and a 0.11 percent urine alcohol concentration. The Chief Medical Examiner for the State of Arkansas indicated during a hearing conducted by the MP that the assigned engineer's actual BAC at the time of the accident was twice that of the test results. He stated that his calculations and "medical certainty" indicated that the engineer's BAC had been 0.08 percent at the time of the accident. The medical examiner stated that the additional 0.04 percent alcohol had been lost as a result of heat. He calculated that the engineer would have had to consume the

equivalent of eight to ten 12-ounce cans of 4 percent beer during the previous 1 to 2 hours to obtain this BAC level. This BAC alcohol consumption equivalent was not corroborated by the Federal Aviation Administration's (FAA) Office of Aviation Medicine or by an independent forensic pathologist. They were contacted for additional opinions about what the toxicological test results indicated because of the burned condition of the bodies. While the FAA and the independent pathologist both believed the 0.04 percent BAC test result to be correct, they indicated that the test result could not be definitively adjusted for the heat exposure. In estimating the percentage of alcohol involved in a person's blood after drinking, it is generally accepted by the medical profession that minimally 0.015 percent of BAC is metabolized in an hour. The State of Arkansas considers that a 0.10 percent BAC is presumptive of drivers being under the influence of alcohol. There are no Federal regulations pertaining to the use of alcohol or drugs by locomotive engineers and other crewmembers.

Toxicological tests also were conducted on samples of the front brakeman's blood and urine and no alcohol or drugs were found.

Fire

Fuel oil which leaked from the damaged fuel oil tank of the lead locomotive unit of Extra 2948 South was ignited by an undetermined source and burned with intense heat. A fire truck dispatched from Newport had to be driven down the track from a road crossing north of the accident site to gain access to the burning locomotive unit. In order to make way for the fire truck, the northbound train was used to pull the cars which remained on the track from the site. This delayed the firefighting effort about 1 hour. Firefighting was delayed another hour because water was not immediately available and additional equipment with water had to be dispatched to the scene. These delays allowed the locomotive to burn more extensively than might otherwise have been the case.

Tests and Research

Postaccident sight distance tests were conducted using the same type of locomotive unit as that of Extra UP 2948 South. The test results indicated that the minimum clear sight distance of the automatic signal that would have been displaying an approach aspect was 13,745 feet, and that the sight distance to the home signal that would have been displaying a stop aspect was 923 feet. Immediately following the accident, MP signal department personnel and FRA investigators tested the signal system and found it to be free of defects.

FRA investigators for the Safety Board witnessed a postaccident test of the air brake system of the portion of Extra UP 2948 South's train which remained on the track and found no evidence of a defective braking system.

Immediately after the fire was extinguished, carrier officials boarded and recorded the following control positions:

<u>Control</u>	<u>Position</u>
Throttle	Idle
Automatic Brake Valve	Emergency
Independent Brake Valve	Full application and handle broken
MU2A Valve	Cut IN
Reverser	Forward
Dynamic Brake	Motoring

The Safety Board calculated that the average speed of Extra UP 2948 South over a distance of 2,726 feet, just before the accident was more than 50 mph. (See appendix E.)

Other Information

About 2 hours 40 minutes after the accident, the Jackson County Sheriff and a special agent employed by the MP found five cans of beer lying on the right-of-way near the derailed lead unit. No additional cans were found in a further search of the right-of-way in the area. The cans were unopened and cooler than the ambient temperature. An MP general car foreman opened the charred cooler that was in the lead unit's cab and found five cans of the same brand of beer. One of the cans had exploded as a result of heat, and four cans were still intact. The identification stamp on all the cans was traced to retailers in the Mountain Home area. When questioned regarding their knowledge of beer being brought onto the train, neither the deadheading crew nor the surviving members of the assigned crew admitted knowing that the beer was present. The deadheading engineer said that he did not see anyone drinking beer between Cotter and Newport, that the assigned engineer and head brakeman behaved rather quietly during the trip, and that both the assigned engineer and head brakeman sat on the brakeman's side of the cab.

The MP had arranged lodging for the use of train crews at a motel in Mountain Home during their away-from-home layovers. The motel lounge sold alcoholic beverages, and the beer could have been purchased there; however, no witnesses would confirm that any member of these two crews purchased the beer while there during their layover. The crews were transported in a motor vehicle supplied by the motel to travel the 12 miles between Mountain Home and Cotter. No MP supervising official was on duty when the assigned crew reported for duty at Cotter yard before beginning their scheduled 245-mile freight train operation.

The personal bag brought on board Extra UP 2948 South by the assigned engineer was reportedly large enough to contain several six packs of beer.

The deadheading engineer related to Safety Board investigators that the engineer and conductor assigned to Extra UP 2948 South were together at Cotter yard when they asked him to operate the train to Newport; this request was overheard by the deadheading conductor. The deadheading engineer also stated that the assigned engineer moved into the engineer's seat when he vacated it at Newport. The assigned conductor told Safety Board investigators that he had no knowledge of the deadheading crew's presence on his train and denied making a request that the deadheading engineer operate the train as was related by the deadheading conductor.

Statements given to Safety Board investigators indicated that none of the headend crewmembers of Extra UP 2437 North could recall hearing a whistle signal by Extra UP 2948 South at about the time it would have crossed the grade crossing, 2,726 feet north of a 10-foot clearance point at Glaise Junction. Rule 14L requires that the whistle be sounded as a warning at grade crossings.

ANALYSIS

The Accident

Extra UP 2437 North was being operated in compliance with MP rules and special instructions at Glaise Junction. Based on the fact that the signal system was tested immediately after the accident and found to be free of defects, the Safety Board

concludes that the signal system was functioning properly as Extra UP 2948 South approached Glaise Junction, and that the train was not operated in compliance with the signals. The train should have been slowed immediately to the required 40 mph speed as it passed the approach signal 2 1/2 miles north of Glaise Junction, and after slowing should have continued to slow prepared to stop for the home signal 519 feet north of the junction switch.

Postaccident tests of portions of the train brake system revealed no defects, and if operated properly, the train could have been stopped at the home signal while Extra UP 2437 North cleared the switch. Additionally, postaccident inspections and tests revealed no defective condition on the cars of Extra UP 2948 South that did not derail. Since Extra UP 2948 South did not stop and struck Extra UP 2437 North with such force as to reverse the direction of the last two cars as they moved at 50 mph, the Safety Board concluded that the locomotive crewmembers of Extra UP 2948 South were not properly operating the train. The investigation therefore concentrated on crew performance, evidence of alcohol use, and the quality of supervision of employees by operating officials. In view of the degree of destruction inflicted on the cab of Extra UP 2948 South, the Safety Board also examined the crashworthiness of the equipment.

Crew Performance

The assigned engineer's and assigned conductor's request that the deadheading engineer operate the train because the assigned engineer claimed not to be familiar with the territory between Cotter and Newport was unique and contrary to the carrier's operating rule Q. The MP engineer was required to tell company officials before accepting the assignment if he believed he was not familiar with the territory. Additionally, the deadheading engineer, in compliance with company rules, should have refused the request to operate the train. However, since the assigned engineer had made 13 trips over the territory, several of which were made with the assigned conductor, the assigned engineer and the conductor would have known that the assigned engineer was considered qualified by the MP. Locomotive engineers are typically qualified for unfamiliar territory by operating the train while accompanied by a route-familiar engineer or a road foreman of engines who acts as a tutor, not as a substitute. The MP does not maintain records which would indicate if a road foreman of engineers ever rode with the assigned engineer over the territory. However, based on the fact that the engineer had made 13 recent trips over the territory, the Safety Board concludes that the assigned engineer was familiar with the assigned route. Since the assigned engineer had requested the deadheading engineer to operate the train from Cotter to Newport, and since the head brakeman took over the locomotive controls at some point between Newport and the accident site, it is not unreasonable to conclude that the engineer was somehow impaired in his ability to perform his duty--unfamiliarity with the route not appearing to be a valid explanation.

Alcohol Use

The relatively cold beer cans found near the derailed and overturned lead locomotive unit were the same brand and had identical identification codes as the cans found in the cooler in the lead locomotive unit. This suggests that beer from the vicinity of Mountain Home had been brought on board the locomotive. The deadheading crew may not have been aware of the presence of beer on the locomotive because the personal bag brought on board by the engineer was reportedly large enough to contain several six packs of beer, and the beer could have been transferred from the bag to the cooler in the locomotive after the deadheading crew detrained at Newport. Although it is not known

with certainty who brought the beer on board the locomotive, the positive results of toxicological tests performed on the engineer suggest that he had been drinking shortly before going on duty, and perhaps while on duty. Since the engineer's blood had a 0.04 percent BAC when tested 24 hours after the accident, which occurred about 4 hours after he reported to work, it is likely that he boarded the train at Cotter yard with a BAC as high as 0.10 percent. At Newport, the engineer's BAC would have been about 0.04 percent if there had been no drinking en route after leaving Cotter yard. This is based upon using the figure of the engineer's blood metabolizing the alcohol at a rate of 0.015 percent per hour. In addition, the 0.11 percent urine alcohol concentration indicates that the engineer's body was in a "post absorptive" phase and that prior to the accident his BAC was higher than 0.04 percent. Therefore, the Safety Board believes both that the engineer was not in compliance with rule G when he brought beer with him when he boarded the train, and that he was under the influence of alcohol at the time.

The conductor, who is responsible for the performance of the crewmembers while they are on duty, did not take action on the lack of compliance with rule G. The head brakeman, the assigned backup for the engineer, did not take adequate action (if he took any) to prevent the alcohol-influenced engineer from operating the locomotive, for even a short time, when the train left Newport. The reason the head brakeman took over operation of the locomotive between Newport and Glaise Junction could not be determined.

On June 25, 1972, two trains collided on the Southern Pacific Railroad at Indio, California, 3/ about 12 miles east of Thousand Palms, California. As a result of that accident, the Safety Board recommended that the Federal Railroad Administration (FRA):

Include in their proposed Standards for Rules Governing the Operations of Trains, regulations that will in effect prohibit the use of narcotics and intoxicants by employees for a specific period prior to their reporting for duty and while they are on duty. (R-74-9)

As a result of the recommendation, the FRA revised its accident causal code to include a category "impairment of efficiency and judgment due to drugs or alcohol" in order to obtain data on the alcohol issue. Additionally, the FRA supported the cooperative labor-management Railroad Employees Assistance Programs (REAP) directed at helping the problem drinker.

Many industrial psychologists, doctors, and social workers dealing with problem drinkers believe that a person whose BAC exceeds 0.05 percent cannot operate machinery or work around moving equipment without endangering himself and fellow workers. 4/ The rehabilitation programs for problem drinkers treat the use of alcohol as a social problem. The Safety Board is in favor of the rehabilitation of problem drinkers; however, at best these programs only help those who want to be helped. Though an admirable approach, these programs do not prevent employees from coming to work or working while under the influence of or impaired by alcohol. This accident illustrates that alcohol-influenced crewmembers should be prohibited from operating trains.

3/ Railroad Accident Report—"Rear-end Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1983" (NTSB-RAR-74-1).

4/ See Traffic Institute, Northwestern University, "Chemical Tests, Degrees of Alcoholic Influence and the Symptoms or Clinical Signs of Impairment", Kurt M. Dubowski, Ph.D.

The FRA has continually shown since 1972 that it has been unable to develop an effective approach to solving the alcohol problem among railroad workers. As a result of this accident and the derailment of an Illinois Central Gulf Railroad Company (ICG) freight train near Livingston, Louisiana, 5/ the Safety Board issued the following recommendations to the FRA on March 7, 1983:

Immediately promulgate a specific regulation with appropriate penalties prohibiting the use of alcohol and drugs by employees for a specified period before reporting for duty and while on duty. (R-83-30)

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate effective procedures to ensure that timely toxicological tests are performed on all employees responsible for the operation of the train after a railroad accident which involves a fatality, a passenger train, releases of hazardous materials, an injury, or substantial property damage. (R-83-31)

With the assistance of the Association of American Railroads and the Railway Labor Executives Association, develop and promulgate a requirement that alcohol/drug abuse involvement accidents/incidents be fully reported to the FRA. (R-83-32)

Since alcohol-related accidents continue to happen, jeopardizing both the public and nonalcohol-involved employees, the Safety Board encourages the FRA to quickly respond and act in a positive and judicious manner with regard to these recommendations.

The Federal Aviation Administration specifically regulates the use of alcohol and drugs by flight crews as stated in 14 CFR Section 91.11:

- (a) No person may act as a crewmember of a civil aircraft—
 - (1) within 8 hours after the consumption of any alcohol beverage;
 - (2) while under the influence of alcohol; or
 - (3) while using any drug that affects his faculties in any way contrary to safety.

With the Federal regulation as a backup, air carriers in the United States have effectively controlled the problem through stringent self-enforcement. The Safety Board believes that a similar Federal regulation for the railroad industry would have the same positive effect.

Supervision

Conductor Responsibilities.--The conversation involving the assigned engineer, the assigned conductor, and the deadheading engineer during which the assigned conductor asked the deadheading engineer to operate the train was overheard by the deadheading conductor. Although the assigned conductor later denied knowledge of the deadheading crew's presence on the train or of his reported request that the deadheading engineer

5/ Railroad Accident Report--"Derailment of Illinois Central Gulf Railroad Freight Train Extra 9629 East (GS-2-28) and Release of Hazardous Materials, Livingston, Louisiana, September 28, 1982" (NTSB/RAR-83/06).

operate the train, the Safety Board believes that he did have knowledge of both the fact that a deadheading crew was on the train and that the deadheading engineer had been asked to operate the train.

The conductor is in charge of the train and should evaluate his crewmembers' fitness for duty. This conductor's allowing the deadheading engineer to operate the train was not proper and was contrary to rule Q. A conscientious conductor would have exercised his authority to prohibit the substitution of engineers; he would have informed MP officials of the assigned engineer's physical condition and obtained an engineer who was fit for duty. If the conductor thought that the assigned engineer was not able to perform his job for any reason, concern for his own safety as well as that of his fellow crewmembers and the public along the route should have led the conductor to execute his job responsibilities in compliance with company rules.

At Newport, the assigned engineer was seated at the controls of the locomotive as the deadheading engineer detrained; however, none of the assigned crewmembers who survived could say who actually operated the train after it left Newport. The assigned engineer and the head brakeman were alone in the lead locomotive unit of Extra UP 2948 South when it left Newport. While the MP Timetable Special Instructions required that the rear brakeman ride in the cab of the lead locomotive unit when possible, the rear brakeman rode on the second locomotive unit instead of the lead unit to avoid the engineer because of a previous altercation. The conductor, alone in the caboose, did not know what was taking place in the locomotive, and he did not know who was operating the locomotive after the train left Newport. The conductor's failure to keep in radio contact with the engineer made him unaware that the unqualified head brakeman had taken over operation of the train. The conductor explained that since he was unable to communicate because of radio "dead spots," he could not ascertain who was operating the train. While the Safety Board acknowledges that "dead spots" along the route might have been encountered, the Board believes it highly unlikely that they blanketed the entire route.

The conductor shares with the engineer the responsibility for the train's safety. When the conductor is in the caboose of a long freight train, he is often unable to see signal aspects before the locomotive passes them. He has no device in the caboose to indicate the speed of the train, but rather must rely on his experience. He cannot usually monitor the engineer and the front brakeman. During Extra UP 2948 South's operation from Cotter yard to the accident site, the conductor did not attempt to fulfill any of these responsibilities. Since the conductor shares the responsibility for the safety of the train, he must be continually aware of conditions that affect the movement of his train.

On March 14, 1973, as a result of an accident investigation, 6/ the Safety Board recommended that the FRA:

In the promulgation of regulations governing railroad operating rules, where responsibility for safe operation of the train is assigned jointly to the engineer and the conductor, require that they be located and informed so that they can make quick, effective decisions. (R-73-11)

The FRA responded that the caboose is the best location for the conductor to be riding to take action regarding the safety of the train, particularly with the increased use of radios on trains. The Safety Board believed that the reply was not responsive to the recommendation and classified the recommendation as "Closed--Unacceptable Action."

6/ Railroad Accident Report--"Head-on Collision of Two Penn Central Freight Trains, Herndon, Pennsylvania, March 12, 1972" (NTSB-RAR-73-3).

On September 10, 1976, as a result of an accident investigation, 7/ the Safety Board recommended that the FRA:

Promulgate rules to require enginecrews to communicate fixed signal aspects to conductors while trains are en route on signalized track. (R-76-50)

On March 3, 1981, a similar recommendation was issued, as a result of another accident investigation, 8/ to the Association of American Railroads (AAR):

Encourage member railroads to establish rules that require enginecrews to communicate fixed signal aspects to conductors while trains are en route on signalized track. (R-81-48)

The status of both recommendations is currently "Open--Unacceptable Action" and "Closed-Unacceptable Action," respectively. The FRA has not adopted such a requirement, nor has the AAR given its support to such action; rather, the AAR has stated that the recommendation has limited value and might be counterproductive. Despite this, some railroads believe this procedure has merit and have implemented a procedure which requires an acknowledgment from the conductor. 9/ The Safety Board continues to believe that general adoption of the procedure reinforces the alertness of the entire train crew, allows the conductor to better exercise his authority, and provides other traincrews within radio coverage with useful information. Had such a procedure been followed in this instance, the accident might have been avoided.

Because the head brakeman was found pinned in the seat at the controls following the collision, the Safety Board concludes that he was operating the train for some undetermined period of time before the collision. Although a brakeman's operating a locomotive of a train under the supervision of the engineer is not uncommon when there is not a locomotive fireman, 10/ MP's operating rules do not permit a brakeman to do so. The brakeman in the cab of the controlling locomotive unit was not a qualified engineer, and he had no extensive experience in road freight train operation. Therefore, the Safety Board concludes that the brakeman, while operating the locomotive, was unable to control properly the speed of the train and to obey the required signal indications.

While there was no speed tape for Extra UP 2948 South, the Extra UP 2437 North engineer's statement regarding the indicated speed of his train seems highly credible, so the Safety Board was able to calculate the average speed of Extra UP 2948 South using known distances, train lengths, and testimony as to relative train speeds where the opposing trains met. (See appendix E.) The engineer of Extra UP 2437 North stated that his train was moving slightly less than 50 mph through the switch at Glaise Junction. From an examination of the graph in appendix E, it is apparent that even allowing

7/ Railroad Accident Report--"Head-on Collision of Two Penn Central Transportation Company Freight Trains, near Pettisville, Ohio, February 4, 1976" (NTSB-RAR-76-10).

8/ Railroad Accident Report--"Side Collision of Norfolk and Western Railway Company Train No. 86 with Extra 1589 West, near Welch, West Virginia, September 6, 1980" (NTSB-RAR-81-2).

9/ Railroad Accident Report--"Head-on Collision Between Baltimore & Ohio Railroad Company Train No. 88 and the Brunswick Helper, near Germantown, Maryland, February 9, 1981" (NTSB-RAR-81-6).

10/ Railroad Accident Report--"Rear End Collision of Louisville and Nashville Railroad Company Trains No. 586 and Extra 8072 North, New Johnsonville, Tennessee, December 28, 1981" (NTSB-RAR-82-4).

reasonable tolerances, Extra UP 2948 South was being operated well in excess of the 40 mph allowable speed of the approach signal indication and certainly not at a speed that would have allowed the train to be stopped short of the home signal at Glaise Junction. The conductor's failure to monitor the speed of the train allowed the locomotive crewmembers to operate the train well in excess of the maximum authorized speed of 50 mph. The fact that the southbound train's whistle was not sounded at the crossing immediately north of Glaise Junction suggests that the crewmember operating the train may have been more concerned with train speed, and his ability to stop it when he saw the oncoming northbound train, than he was with the sounding of the train's whistle for the crossing. The Safety Board believes that the fact that sound of the emergency air brake application was heard just after the locomotive of the two trains had passed each other is a valid indication that at least one of the headend crewmembers of Extra UP 2948 South, most likely the head brakeman since he was found in the engineer's seat, was not incapacitated, and that he had become aware suddenly of the impending collision and was trying to stop the train.

MP Officials.--Since the crewmembers reported for duty at a location where they were not observed by an operating department official, the MP did not have an effective means to verify their fitness for duty. A long interdivisional operation over a railroad places increased demands on the crew to stay especially alert. Such demands can be met only by crewmembers who are physically and mentally fit. Safety Board investigations of other train collisions also have revealed these factors in long interdivisional operations in which crewmembers have similarly reported for work without a railroad official evaluating their fitness for duty. 11/ Upon completion of its investigations of accidents at Orleans Road, West Virginia, on February 12, 1980, 12/ and at Welch, West Virginia, on September 6, 1980, 13/ the Safety Board made the following recommendation to the Baltimore and Ohio Railroad (R-80-40) and to the Norfolk and Western Railway (R-81-38):

Establish supervisory procedures at crew-change terminals to insure that all operating department employees coming on duty at any hour of the day are physically fit and capable of complying with all pertinent operating rules.

Both railroads recently responded that they would revise their operating plans to increase the frequency of supervisors being in contact with employees; however, they did not anticipate putting additional supervisors on duty during nighttime working hours at terminals. The Board has not evaluated these recent responses.

If MP officials had been aware of the engineer's condition, the engineer of Extra UP 2948 South probably would not have been permitted to work. Consequently, the Safety Board believes that the MP should develop a method through which crewmembers

11/ Railroad Accident Reports--"Rear-End Collision of Two Southern Pacific Transportation Company Freight Trains, Indio, California, June 25, 1973" (NTSB-RAR-74-1); and "Rear-End Collision of Consolidated Rail Corporation Freight Trains ALPG-2 and APJ-2, near Roversford, Pennsylvania, October 1, 1979" (NTSB-RAR-80-2).

12/ Railroad Accident Report--"Head-on Collision of Baltimore and Ohio Freight Trains Extra 6474 East and Extra 4367 West, Orleans Road, West Virginia, February 12, 1980" (NTSB-RAR-80-9).

13/ Railroad Accident Report--"Side Collision of Norfolk and Western Railway Company Train No. 86 with Extra 1589 West, near Welch, West Virginia, September 6, 1980" (NTSB-RAR-81-2).

can be evaluated around-the-clock by supervisors either before, or while reporting for, work at crew-change terminals.

The Safety Board concludes that this accident could have been prevented had the crewmembers complied with pertinent MP operating rules. Furthermore, the Safety Board believes that the MP needs more effective training and closer monitoring of practices to make conductors more effective as supervisors and brakemen more willing to assert their authority for rule compliance when conductors and engineers fail to perform adequately. The Safety Board recognizes that training of employees to assert themselves effectively when superiors fail to comply with operating rules is a very difficult undertaking. However, since brakemen are assigned a backup role in the MP's safety system, the MP should find some way to ensure that brakemen assert themselves consistently through proper action when the circumstances require it.

Crashworthiness

The Safety Board recognizes that the accident at Glaise Junction was a high-speed collision and that it is difficult to design adequate crashworthiness features for such accidents. However, once again an accident has occurred in which the engineer and head brakeman were killed by the collapse of the locomotive cab structure. The cab was not designed structurally to provide survivable crash protection.

In its investigation of an accident at Riverdale, Illinois, on September 8, 1970, the Safety Board identified as a factor in the severity of the accident the lack of crash protection provided the occupants of locomotives. It issued a recommendation to the FRA for timely improvement of the crashworthiness of railroad equipment, particularly as it is related to the protection of the occupants of locomotive control compartments. In a letter to the Safety Board dated May 3, 1971, the FRA outlined its recognition of this problem and set up a meeting with the locomotive and car builders, labor organizations, carriers, and the AAR. On January 16, 1973, the FRA advised the Safety Board that a locomotive control compartment committee had been organized, that the AAR had requested a contractor to design a program of testing to determine locomotive cab crashworthiness, and that the test program would set requirements for antilimbing devices and design requirements for locomotive crash posts and pilots. Since receiving the FRA response to its original recommendation in 1971, the Safety Board has investigated numerous accidents 14/ in which crashworthiness has been identified as inadequate to provide protection to the occupants of locomotive control compartments.

14/ Railroad Accident Reports--"Freight Train Derailment/Passenger Train Collision with Hazardous Material Car, Sound View, Connecticut, October 8, 1970" (NTSB-RAR-72-1); "Derailment of Extra 5701 East at Sherman, Wyoming, March 28, 1971" (NTSB-RAR-72-4); "Collision of the State-of-the-Art Transit Cars with a Standing Car, High Speed Ground Test Center, Pueblo, Colorado, August 11, 1973" (NTSB-RAR-74-2); "Head-End Collision of Louisville and Nashville Railroad Local Freight and Yard Train at Florence, Alabama, September 8, 1978" (NTSB-RAR-78-2); "Head-End Collision of Amtrak Passenger Train No. 74 and Conrail Train OPSE-7, Dobbs Ferry, New York, November 7, 1980" (NTSB-RAR-81-4); and "Head-On Collision of Boston & Maine Corp. Extra 1731 East and Massachusetts Bay Transportation Authority Train No. 570, Beverly, Massachusetts, August 11, 1981" (NTSB-RAR-82-1).

In its investigation of an accident at Goldonna, Louisiana, on December 28, 1977, 15/ the lack of crashworthiness features on the locomotive resulted in the deaths of two crewmembers. The Safety Board recommended to the FRA (R-78-27) that the FRA expedite its study of improvements in the design of locomotive operator compartments to minimize crash damage. All together, the Safety Board has issued 17 recommendations regarding crashworthiness, and a number of these recommendations have been reiterated. Although the FRA has studied the crashworthiness of locomotives and much data have been developed, including publication of a 1982 report titled "Analysis of Locomotive Cabs," no significant changes in the crashworthiness design standards for locomotives have been adamantly recommended by the FRA or voluntarily made by the industry.

Two recommendations (R-74-20 and -21) made by the Safety Board to the FRA concerning locomotive crashworthiness are currently open pending a satisfactory response from the FRA. The Safety Board urges the FRA to expeditiously address those outstanding unresolved recommendations dealing with the crashworthiness of locomotive operating compartments and other studies related to crashworthiness of passenger-carrying equipment, and move to see that the industry makes use of data and guidelines developed.

CONCLUSIONS

Findings

1. Extra UP 2437 North was being operated in compliance with rules and special instructions at the time of the accident.
2. Extra UP 2948 South was not operated in accordance with the signal indications at the approach and home signals for Glaise Junction.
3. The head brakeman was operating the train at the time of the collision, contrary to rule Q, which prohibits the substitution of positions.
4. Both the signal system and Extra UP 2948 South's brake system functioned properly and neither caused nor contributed to the accident. Postaccident inspections and tests revealed no defective condition on the train cars that did not derail.
5. The engineer previously had relinquished his duties to the deadheading engineer operating Extra UP 2948 South between Cotter yard and Newport, contrary to rule Q.
6. The assigned engineer had sufficient experience over the route to be familiar with it.
7. Alcohol was found in the locomotive of Extra UP 2948 South contrary to the prohibition contained in rule G, which prohibits the use of alcohol and drugs.
8. The assigned engineer's BAC revealed by toxicology tests indicated that he had consumed alcohol contrary to rule G before the accident and that he went on duty with a BAC possibly as high as 0.10 percent.

15/ Railroad Accident Report--"Collision of a Louisville and Arkansas Railway Freight Train and a L.V. Rhymes Tractor-Semitrailer at Goldonna, Louisiana, December 28, 1977" (NTSB-RHR-78-1).

9. The assigned conductor knowingly permitted the deadheading engineer to operate the train contrary to rule Q.
10. The assigned conductor did not exercise his responsibilities to monitor the actions of the locomotive crewmembers and prevent the excessive speed and unsafe operation of his train.
11. The assigned conductor did not function effectively as a supervisor, nor did the head brakeman properly assert himself to prevent the unauthorized substitution of the engineer.
12. The reason the crewmembers in the locomotive did not respond properly to the approach signal could not be determined; however, it is most likely that the unqualified head brakeman did not know the authorized speed and how to properly control the speed of the train.
13. The crushing of the locomotive cab by the collision impact forces caused the fatalities before the bodies were burned in the ensuing fire.
14. Missouri Pacific officials failed to monitor the activities and physical condition of crewmembers reporting for work at Cotter yard on the night of the accident.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the crewmembers on the locomotive of Extra UP 2948 South to reduce the speed of the train, in response to a signal displaying an approach aspect, and to stop the train in response to the junction home signal displaying a stop aspect. Contributing to the accident were: (1) the action of the alcohol-impaired engineer in relinquishing control of the train to the head brakeman who was not a qualified engineer, (2) the failure of the conductor to monitor the engineer's performance in operating the train within prescribed speed limits, (3) the failure of Missouri Pacific officials to supervise the involved operating personnel adequately, and (4) the failure of the conductor and the other involved operating department employees to take proper action when rule violations were apparent.

RECOMMENDATIONS

As a result of this investigation the National Transportation Safety Board made the following recommendations:

--to the Brotherhood of Locomotive Engineers:

Inform its membership of the facts and circumstances of the accident which occurred at Possum Grape, Arkansas, on October 3, 1982, and recommend that they encourage each other to adhere to rule G before reporting and while on duty. (Class II, Priority Action) (R-83-53)

Establish a union policy condemning the use of alcohol and drugs by union members before reporting and while on duty. Develop and implement an active campaign to this end directed to all members. (Class II, Priority Action) (R-83-54)

--to the United Transportation Union:

Inform its membership of the facts and circumstances of the accident which occurred at Possum Grape, Arkansas, on October 3, 1982, and recommend that they encourage each other to adhere to rule G before reporting and while on duty. (Class II, Priority Action) (R-83-55)

Establish a union policy condemning the use of alcohol and drugs by union members before reporting and while on duty. Develop and implement an active campaign to this end directed to all members. (Class II, Priority Action) (R-83-56)

--to the Missouri Pacific Railroad Company:

Establish rules to require enginecrews to communicate fixed signal aspects to conductors while trains are en route on signalized track. (Class II, Priority Action) (R-83-57)

Establish supervisory procedures at crew-change terminals to insure that all operating department employees coming on duty at any hour of the day are physically fit and capable of complying with all pertinent operating rules. (Class II, Priority Action) (R-83-58)

Enhance the training of all operating employees, especially conductors, in their responsibilities and duties so that they understand their responsibility to monitor the performance of other employees and to take positive action when rules violations occur. (Class II, Priority Action) (R-83-59)

--to Members of the Association of American Railroads:

Establish supervisory procedures at crew-change terminals to insure that all operating department employees coming on duty at any hour of the day are physically fit and capable of complying with all pertinent operating rules. (Class II, Priority Action) (R-83-60)

Enhance the training of all operating employees, especially conductors, in their responsibilities and duties so that they understand their responsibility to monitor the performance of other employees and to take positive action when rules violations occur. (Class II, Priority Action) (R-83-61)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ G.H. PATRICK BURSLEY
Member

/s/ DONALD D. ENGEN
Member

June 14, 1983

APPENDIXES

APPENDIX A

INVESTIGATION

Investigation

The National Transportation Safety Board was notified of the accident about 9:20 a.m., on October 3, 1982. An Atlanta Field Office investigator was immediately dispatched to the accident site. The Safety Board also dispatched an investigator from its Fort Worth Field Office to the accident site.

APPENDIX B
CREWMEMBER INFORMATION

The assigned crewmembers of train Extra UP 2948 South were:

Engineer

Samuel P. Mahan, 35, was first employed by the Missouri Pacific (MP) Railroad Company as a temporary fireman on May 29, 1966. He was hired permanently as a fireman in October 1966. He was promoted to an engineer on September 19, 1972.

Head Brakeman

Jerry D. Duncan, 45, was first employed by the MP as a yardman on August 5, 1956. He had been assigned recently to road service about the beginning of September 1982.

Conductor

Eugene T. Walden, Jr., 51, was first employed by the MP as a switchman in November 1953. He was promoted to a conductor on August 10, 1972.

Rear Brakeman

Robert H. Henderson, 56, was first employed by the MP as a switchman on October 17, 1947. He had been assigned recently to road service about the beginning of September 1982.

APPENDIX C

EXCERPTS FROM THE UNIFORM CODE OF OPERATING RULES EFFECTIVE JUNE 2, 1968 MISSOURI PACIFIC RAILROAD

GENERAL RULES.

* * *

B. Employees must have a proper understanding and working knowledge of and obey all rules and instructions in whatever form issued, applicable to or affecting their duties. If in doubt as to their meaning, employees must apply to proper officer for an explanation.

When properly authorized, rules may be cancelled, superseded or changed by:

- (1) General order.
- (2) Special instructions in the timetable or in pamphlet form.

* * *

E. Employees must render every assistance in their power in carrying out the rules and instructions. Courteous co-operation between employees is required for proper functioning under the rules and instructions.

* * *

Q. Employees must report at the appointed time, devote themselves exclusively to their duties, must not absent themselves, nor exchange duties with, or substitute others in their place, without proper authority.

* * *

DEFINITIONS.

* * *

AUTOMATIC BLOCK SYSTEM (ABS).—A series of consecutive blocks governed by block signals, cab signals, or both, actuated by a train, engine, or by certain conditions affecting the use of a block.

CENTRALIZED TRAFFIC CONTROL (CTC).—A block signal system within which train movements are authorized by block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

* * *

BLOCK SIGNAL.—A fixed signal at the entrance of a block to govern trains or engines entering and using that block.

OPERATING RULES.

* * *

6. General Orders and Special Instructions.—

General orders will be numbered consecutively beginning with January first of each year; will be issued and cancelled by the superintendent or other designated officer, and will expire with the calendar year. They supersede any rule or special instructions with which they conflict.

Train, engine and yard employees, train dispatchers, and other employees whose duties require, must familiarize themselves with general orders and other notices before commencement of each trip or day's work.

Conductors, engineers and engine foremen must record information on prescribed form indicating that they have read and understand general orders and are responsible for compliance therewith. Location of general orders will be designated by special instructions.

Special instructions in the timetable, or when issued in pamphlet form, supersede any rule with which they conflict.

* * *

101 (a). Members of crew must know, by speed of train, grade conditions, or caboose air gauge, that train is being handled safely and under control, and, when necessary, take immediate action to get train under control.

If any crew member of a train has reason to believe the train has passed over any dangerous defect, the train must be stopped and protection afforded.

* * *

RESPONSIBILITY OF TRAINMEN AND ENGINEMEN.

107. **Co-operation Between Crew Members.**—Conductors and engineers must bring about co-operation between all members of the crew.

* * *

(2) The general direction and government of a train is vested in the conductor, and all persons employed on the train must obey his instructions. Should there be any doubt as to authority or safety of proceeding from any cause, the conductor must consult the engineer and be equally responsible

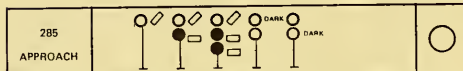
with him for the safety and proper handling of the train.

Conductors and engineers are responsible for the protection of their train. Conductors are responsible for the position of switches used by them and their trainmen.

* * *

**BLOCK SIGNAL, CAB SIGNAL, AND
INTERLOCKING SIGNAL INDICATIONS**

* * *



Proceed, immediately reducing to 40 MPH or slower if necessary, prepared to stop before reaching next signal.



Stop.

* * *

**RULES APPLICABLE TO BOTH
BLOCK AND INTERLOCKING SIGNALS.**

* * *

327. Where Stop Must be Made.—A train or engine must stop before any part of the train or engine passes a Stop, or Stop, Then Proceed at Low Speed indication. If a train or engine overruns a Stop, or Stop, Then Proceed at Low Speed indication, the fact must be reported to the train dispatcher.

* * *

**RULES GOVERNING MOVEMENT OF
TRAINS AND ENGINES BY BLOCK SIGNALS.**

CENTRALIZED TRAFFIC CONTROL (CTC) RULES.

400. Movement by Signal Indication.—Within defined limits on designated tracks, so specified on the timetable, or by special instructions, the movement of trains and engines will be governed by block signals whose indications will supersede the superiority of trains for both opposing and following movements on the same track, but do not supersede train orders. Trains or engines must not enter CTC territory unless the governing signal displays a proceed indication or authority is obtained from the control operator. Trains or engines must not enter, foul, or re-enter after having cleared main track,

a controlled siding, or other controlled track, at hand operated switches without first obtaining authority from control operator including track and time limits, except control operator may authorize train or engine to occupy main track and then make a straightaway movement at Low Speed to the next signal without track and time limits.

Such operating rules, interlocking rules and automatic block signal rules as are not modified by these rules, remain in force.

The movement of trains and engines will be supervised by the train dispatcher, who will issue instructions to the control operator, when required.

APPENDIX D

EXCERPTS FROM MISSOURI PACIFIC RAILROAD COMPANY
TIMETABLE NO. 18, EFFECTIVE 12:01 A.M.
SUNDAY, OCTOBER 25, 1981

12 HOXIE SUBDIV. — ARKANSAS DIVISION

HOXIE SUBDIV. — ARKANSAS DIVISION 13

SOUTH FIRST CLASS		Radio Communication via Channel One, call-in Two.		STATIONS		Station Miles		Siding		Cars		Ft.		NORTH FIRST CLASS	
21	Page.	Mon. Wed. Fri.	Miles											22	Page.
AM														AM	
2	52		165.5	POPLAR BLUFF... ②-2 MI	X-166	Yd.								2	40
			170.0	STANLEY.....I	X-170										
			172.9	HARVELL JCT.....	X-173										
			180.4	NEELYVILLE, MO.....T	X-180	162	2457								
			192.2	CORNINO, ARK.....②-2	X-192	161	3376								
			199.0	KNOBEL.....	X-199	188	3600								
			202.9	PEACH ORCHARD.....	X-203	155	3088								
			214.4	O'KEAN.....	X-214	160	3339								
			223.6	MURTA JCT.....	X-223										
3	43		224.9	WALNUT RIDGE.....	X-225										
			226.3	HOXIE S.B. N.....②-2 MI	X-226	166	3641								
			228.5	MINTURN JCT.....	X-228										
			238.9	ALICIA.....	X-239	162	3448								
			251.8	TUCKERMAN.....	X-252	162	3436								
			258.1	CAMPBELL JCT.....	X-258										
			259.4	DIAZ JCT.....IT	X-259										
4	19		261.7	NEWPORT.....②-2 MI	X-262	Yd.									
			263.9	NORTH BRIDGE JCT.....	X-264										
			264.1	WHITE RIVER.....②-2	X-265										
			264.5	SOUTH BRIDGE JCT.....	X-265										
			268.7	JIFFY.....I	X-269										
			274.3	OLAISE JCT.....	X-275										
			278.1	BRADFORD.....	X-278	190	3833								
			286.7	RUSSELL JCT.....	X-286										
			288.4	BALD KNOB.....②-2 MI	X-288	110	5763								
			289.7	JUD.....I	X-289										
			296.4	KENSSETT.....	X-296										
			298.4	HIO.....I	X-298										
			306.5	MACKE.....	X-306										
			312.7	BEEBE.....②-2	X-313										
			319.2	WACHS.....I	X-320										
			330.7	JAX.....I	X-331										
			332.1	JACKSONVILLE.....T	X-332										
			343.6	NO. LITTLE ROCK.....②-2 MI	X-344	Yd.									
5	41		346.6	L. ROCK AMTRK. STA.....	X-346										
AM														11	57
														PM	

189.1

MAXIMUM SPEED	MPH	Pgr. Frt.	BUSINESS TRACKS	MP	Sta. No.
MP 172-04 — MP 172-37.....	75	80	Harvell.....	173.0	X-174
MP 179-08 — MP 179-12.....	85	—	Delaplaine.....	207.8	X-208
MP 184-37 — MP 185-04.....	70	—	Minturn.....	232.4	X-232
MP 191-21 — MP 192-33.....	50	40	Olyphant.....	269.8	X-270
MP 192-38 — MP 193-12.....	70	55	Judsonia.....	282.6	X-283
MP 224-12 — MP 227-29.....	50	50+	Huginson.....	298.7	X-300
MP 258-00 — MP 263-37.....	50	50+	McTear.....	308.2	X-308
MP 263-37 — MP 264-21.....	35	35	Ward.....	317.8	X-319
MP 264-21 — MP 265-00.....	70	—	Cabot.....	323.0	X-323
MP 266-21 — MP 268-33.....	70	—	Valentine.....	330.1	X-336
MP 288-04 — MP 288-21.....	40	40+			
MP 292-03 — MP 292-35.....	80	—			
MP 292-25 — MP 293-04.....	55	55			
MP 294-02 — MP 294-20.....	70	—			
MP 296-03 — MP 296-22.....	85	—			
MP 307-35 — MP 308-29.....	85	—			
MP 312-07 — MP 313-05.....	85	—			
MP 317-07 — MP 317-36.....	85	—			
MP 319-30 — MP 320-25.....	85	—			
MP 329-15 — MP 333-20.....	85	—			
MP 333-07 — MP 333-19.....	80	—			
MP 339-15 — MP 339-20.....	85	—			
MP 388-20 — MP 347-15.....	40	40			
North and South Wye Bald Knob.....	15	15			

Remote control switches are No. 15, 16 or 20 except:

Poplar Bluff — MP 165-22 crossover East Main — To south end Poplar Bluff yard.

Hoxie — 3 switches north end of siding.

Newport — West main track to south end of yard.

Bald Knob — All switches coal chute crossover — siding and Memphis Subdiv. conn.

No. Little Rock — 3 switches north end departure lead, 3 switches north end receiving yard, all main track crossovers, 5 switches Locust St. and south end running track.

Hot Box and Dragging Equipment Detectors located at *MP 188-22, *MP 207-22, *MP 232-17, *MP 255-09, *MP 283-14 and *MP 312-10.

Trains originating Poplar Bluff and No. Little Rock or Little Rock Amtrak Station, secure clearance.

ABS — CTC between Poplar Bluff and No. Little Rock.

Two main tracks designated East and West Track between Poplar Bluff & Harvell Jct., Murta Jct. & Minturn Jct., Campbell Jct. & North Bridge Jct., South Bridge Jct. & Glaise Jct., Russell Jct. & No. Little Rock.

Arkansas Division jurisdiction includes DK&S Industrial Lead 5.5 miles between Kensett, Doniphan and Searcy. Maximum speed 25 MPH except 10 MPH on curves. Uniform Code of Operating Rules applies.

* * *

SPECIAL INSTRUCTIONS

* * *

(7) RULE 34 & 34(a): Employees located in the operating compartment of an engine must communicate to each other in an audible and clear manner the name of each signal affecting movement of their train or engine, as soon as the signal is clearly visible. It is the responsibility of the engineer to have each employee comply with these requirements, including himself.

It is the engineer's responsibility to have each employee located in the operating compartment maintain a vigilant look-out for signals and conditions along the track which affect the movement of the engine or train.

If a crew member becomes aware that the engineer has become incapacitated or should the engineer fail to operate or control the engine or train in accordance with the signal indications or other conditions requiring speed to be reduced, other members of the crew must communicate with the crew member controlling the movement at once, and if he fails to properly control the speed of the train or engine, other members of the crew must take action necessary to insure the safety of the train or engine, including operating the emergency valve.

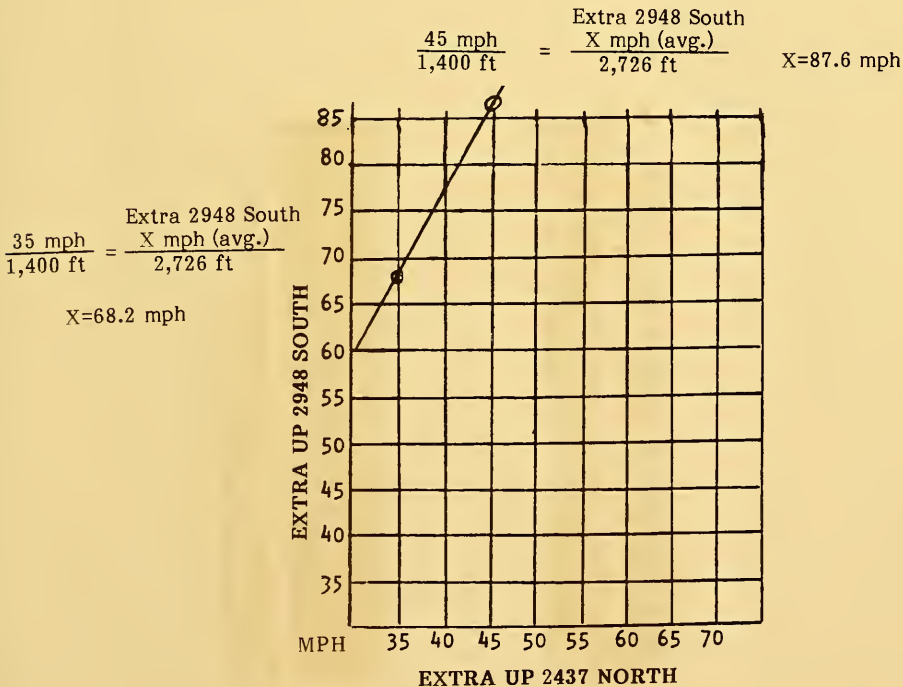
* * *

(24) OCCUPY LEAD UNIT: Head brakeman on freight trains will ride lead unit when practicable. This will apply to other crew members riding head end.

APPENDIX E

CALCULATED APPROXIMATE AVERAGE SPEED OF EXTRA UP 2948 SOUTH RELATIVE TO ANY SELECTED SPEED FOR EXTRA UP 2437 NORTH

The engineer of Extra UP 2437 North stated that the locomotives of the opposing trains met at the first road crossing north of Glaise Junction. The distance from the 10-foot clearance point (point-of-impact) for the switch at Glaise Junction to the road crossing was 2,726 feet. The overall length of Extra UP 2437 North was 4,781 feet. At the time the locomotives met at the road crossing, there would have been approximately 2,000 feet of Extra UP 2437 North south of the 10-foot clearance point at Glaise Junction. Because the point of impact at the eighth car ahead of the caboose of Extra UP 2437 North was about 600 feet from the rear of the train, approximately 1,400 feet of Extra UP 2437 North had to move past the 10-foot clearance point after the locomotives met at the crossing. The engineer of Extra UP 2437 North stated that his train was moving at slightly less than 50 mph. In order to allow for latitude in both the speed of Extra UP 2437 North and the proximity of their meeting point at the road crossing, the following graph indicates the relative average speed of Extra UP 2948 South between the road crossing and the point of impact:





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